

Helwan University
Faculty of Engineering – Mataria



A Course on

Energy Conservation

Energy Sources

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October 2012

Introduction

There are different ways in which energy around us can be stored and converted for our use.

Three categories:

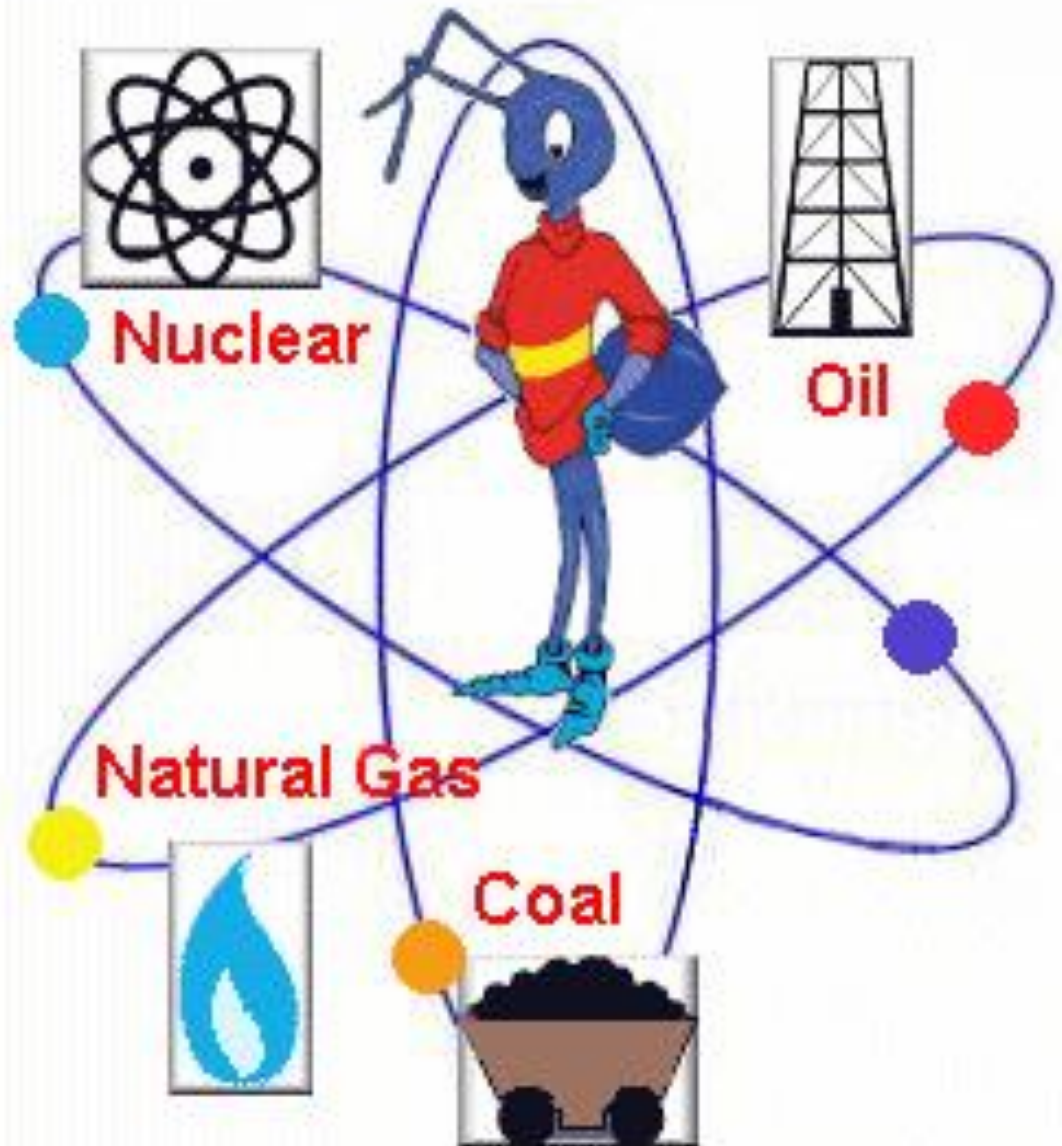
Fossil fuels

Renewable sources

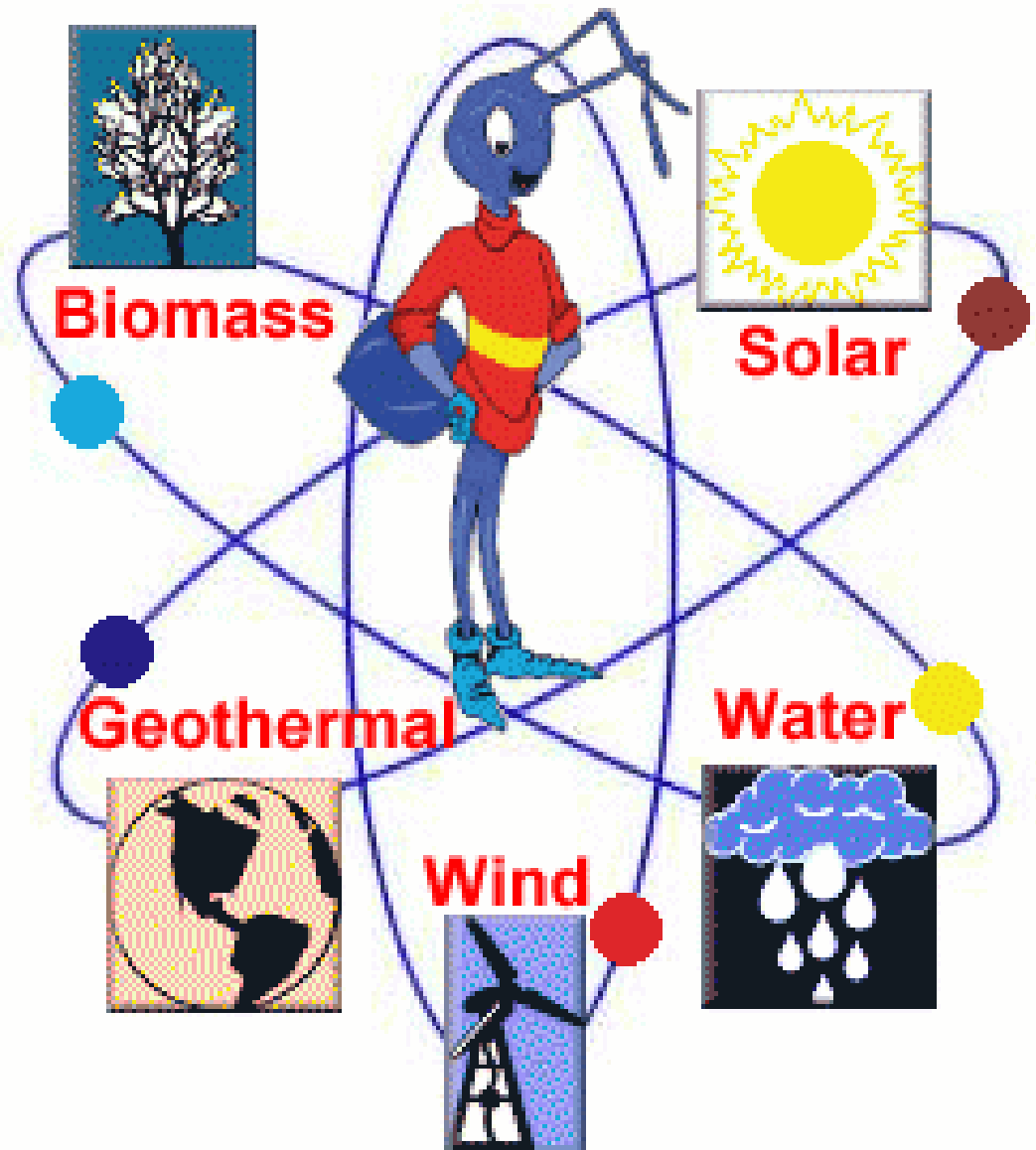
Nuclear sources.



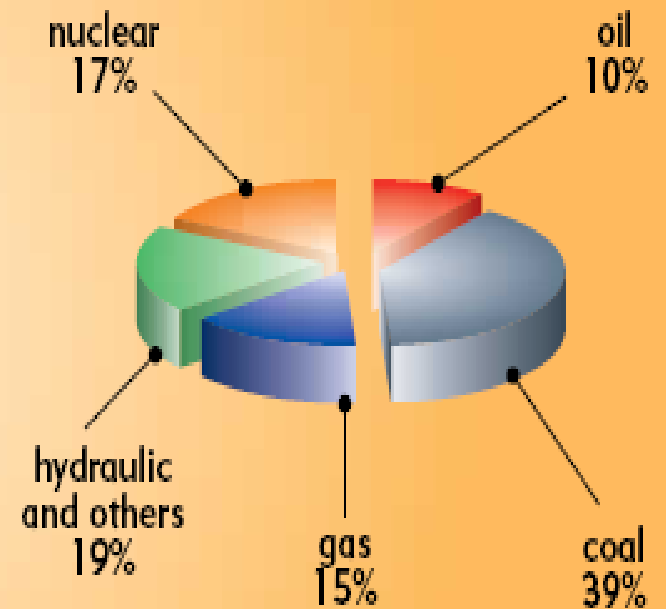
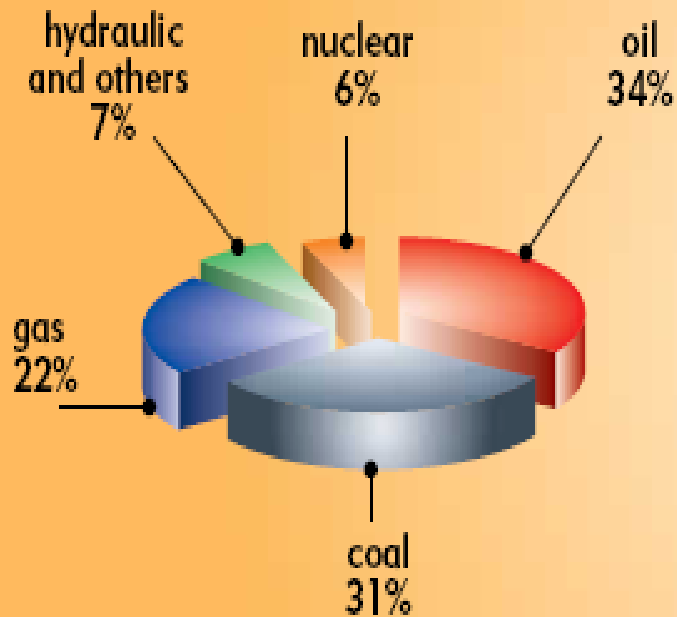
Non-renewable Energy



Renewable Energy

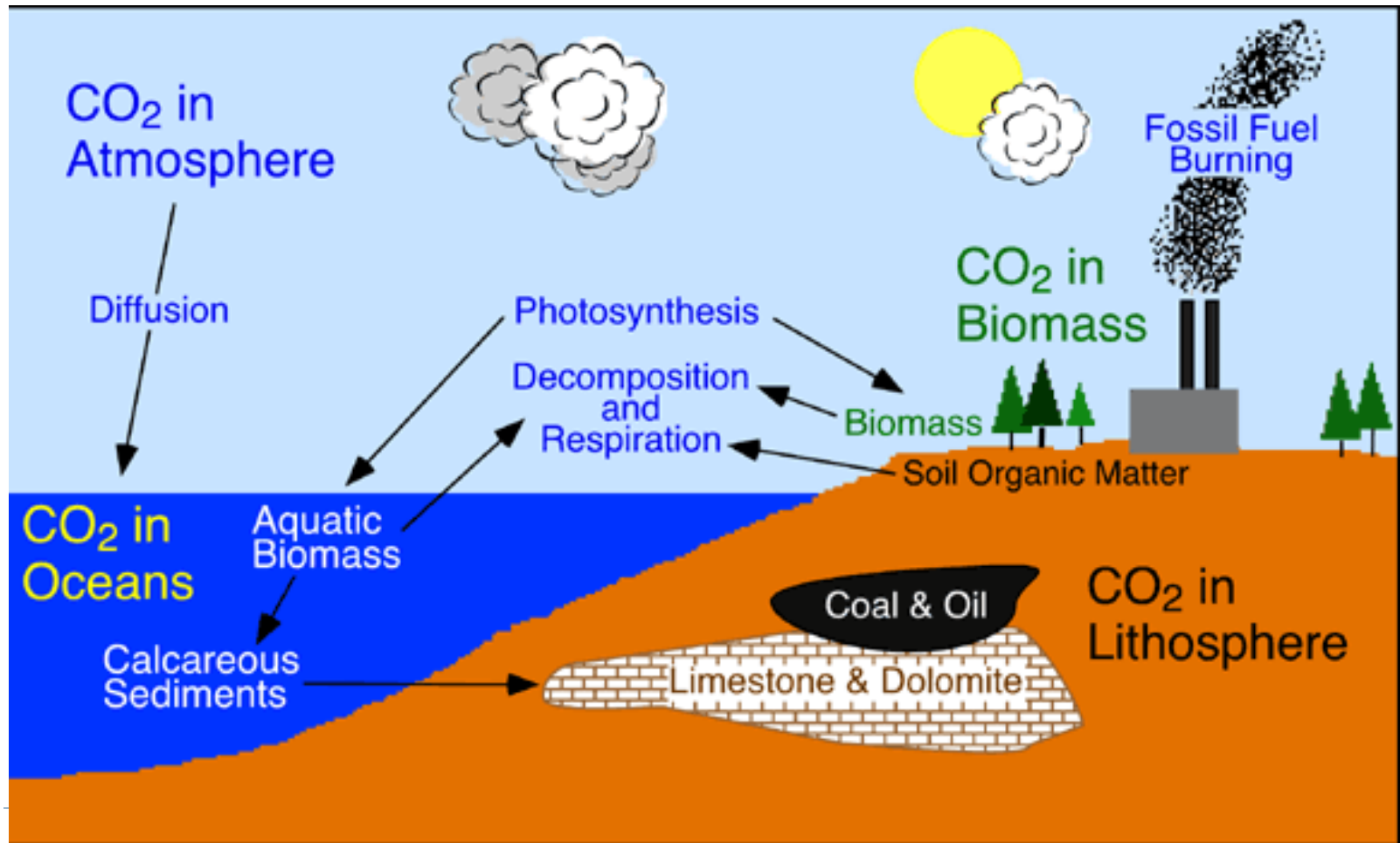


The Energies for Today and Tomorrow



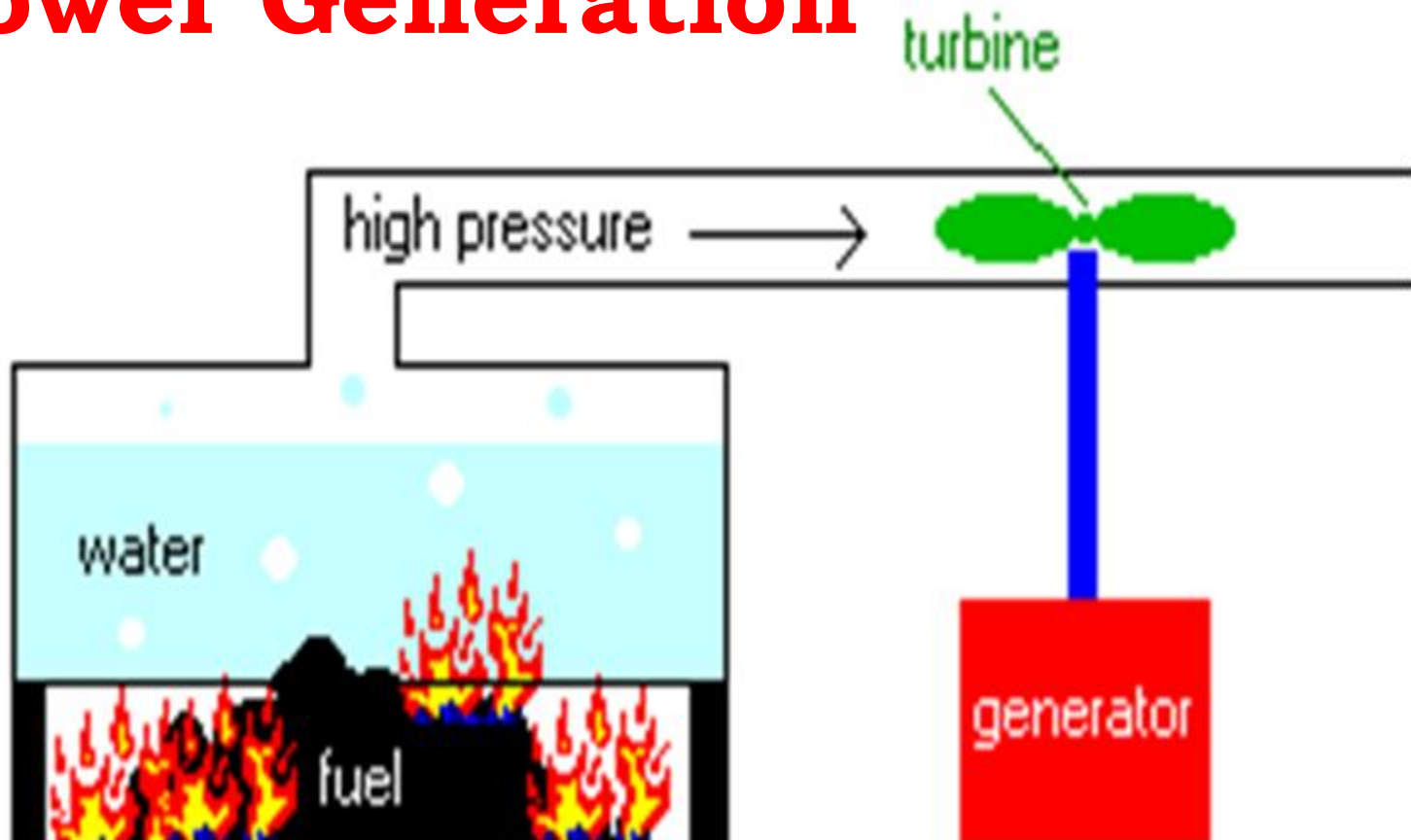
Fossil Fuels

Burning fuel releases energy stored as heat.



Theory - Fossil Fuels

Power Generation



Advantages - Fossil Fuels

- **Depending on fuel, good availability.**
- **Simple combustion process can directly generate electricity.**
- **Inexpensive.**
- **Easily distributed.**



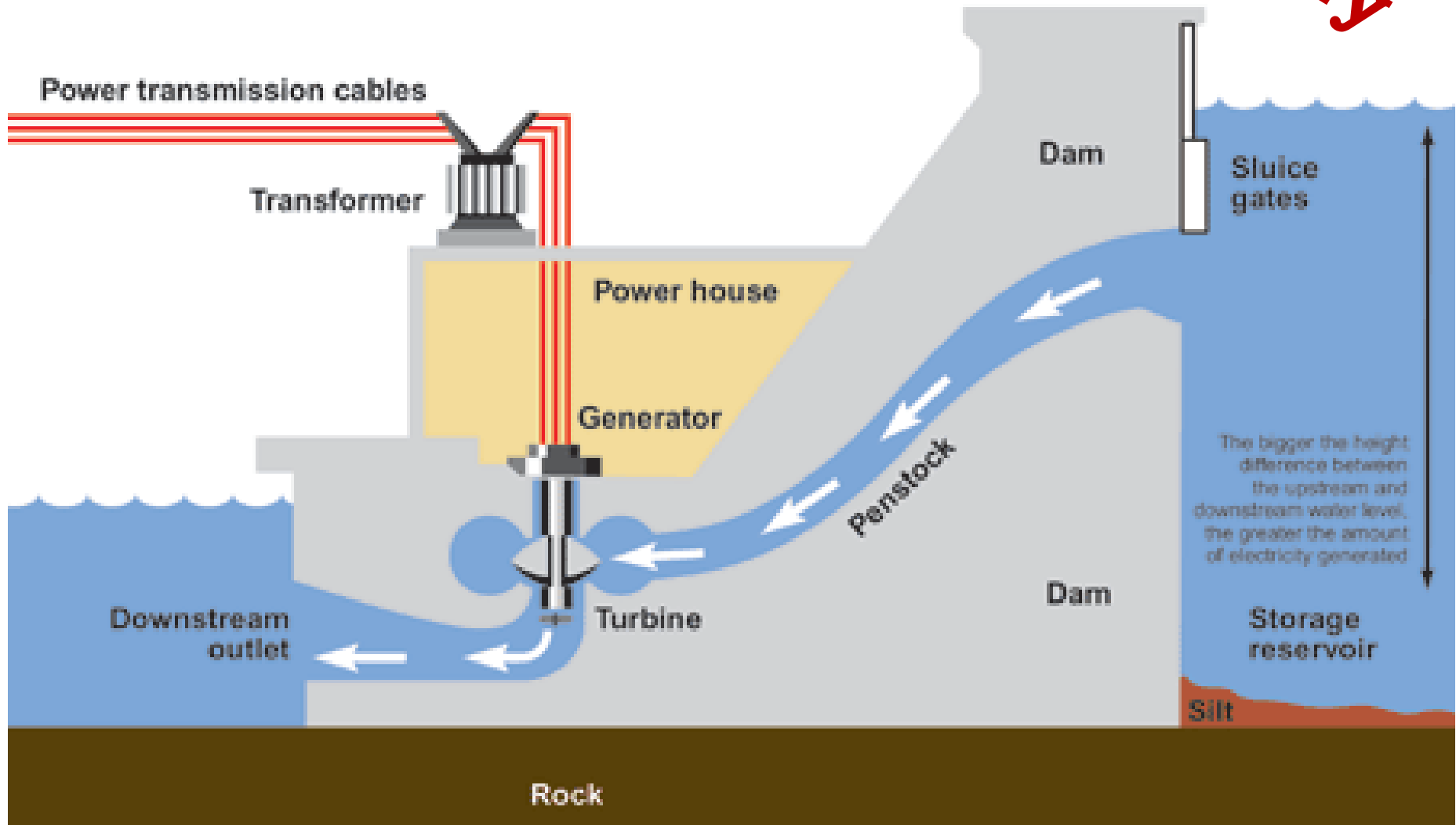
Disadvantages - Fossil Fuels

- **Probable contributor to global warming.**
- **Price swings based on politics of oil regions.**
- **Cause of acid rain.**
- **Produces emissions.**

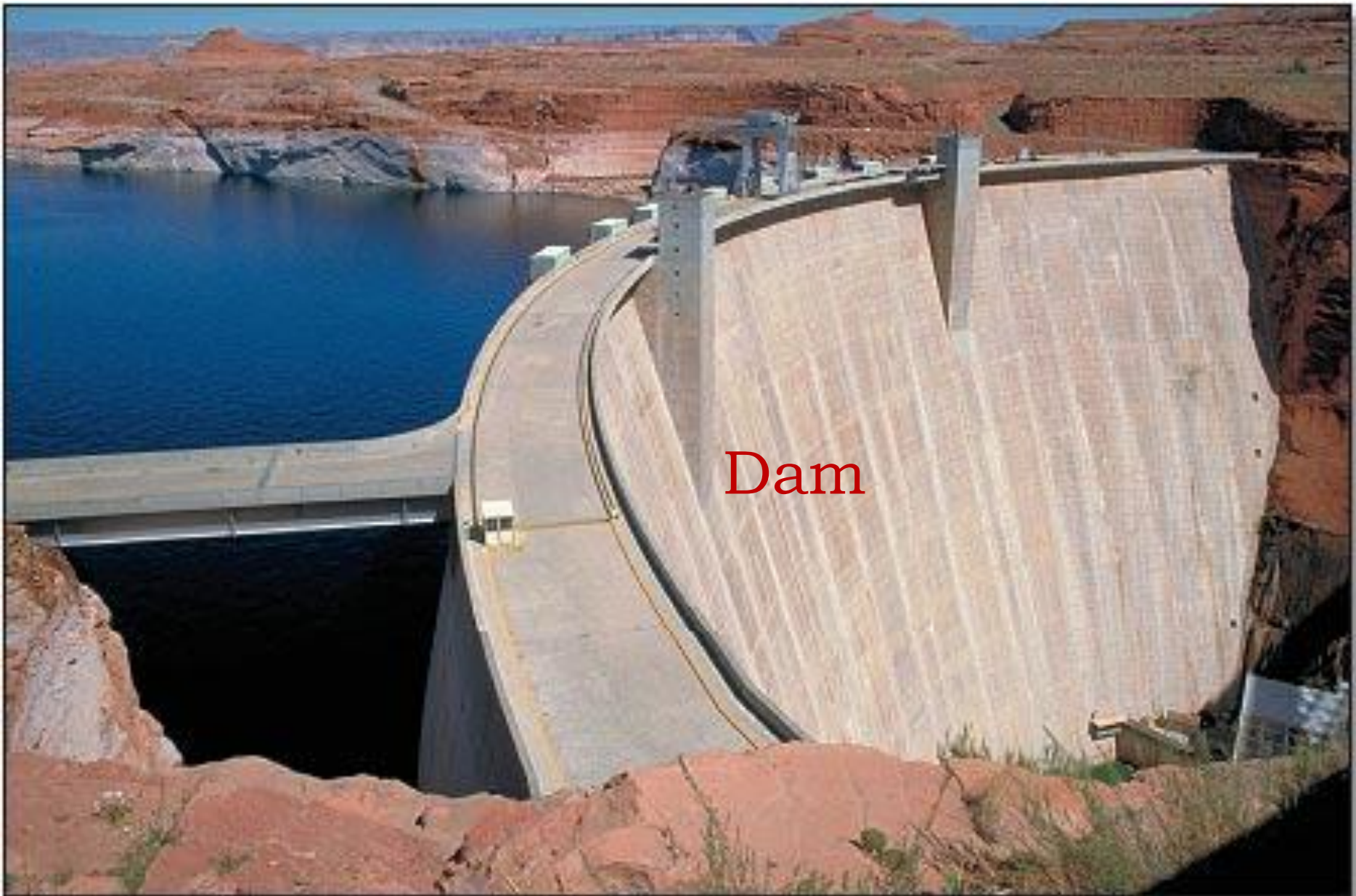


Hydroelectric Energy

Theory



Hydroelectric Energy



Advantages -Hydroelectric Energy



- **Inexhaustible source.**
- **Minimal environmental impact.**
- **Viable source--relatively useful levels of energy production.**
- **Can be used throughout the world.**

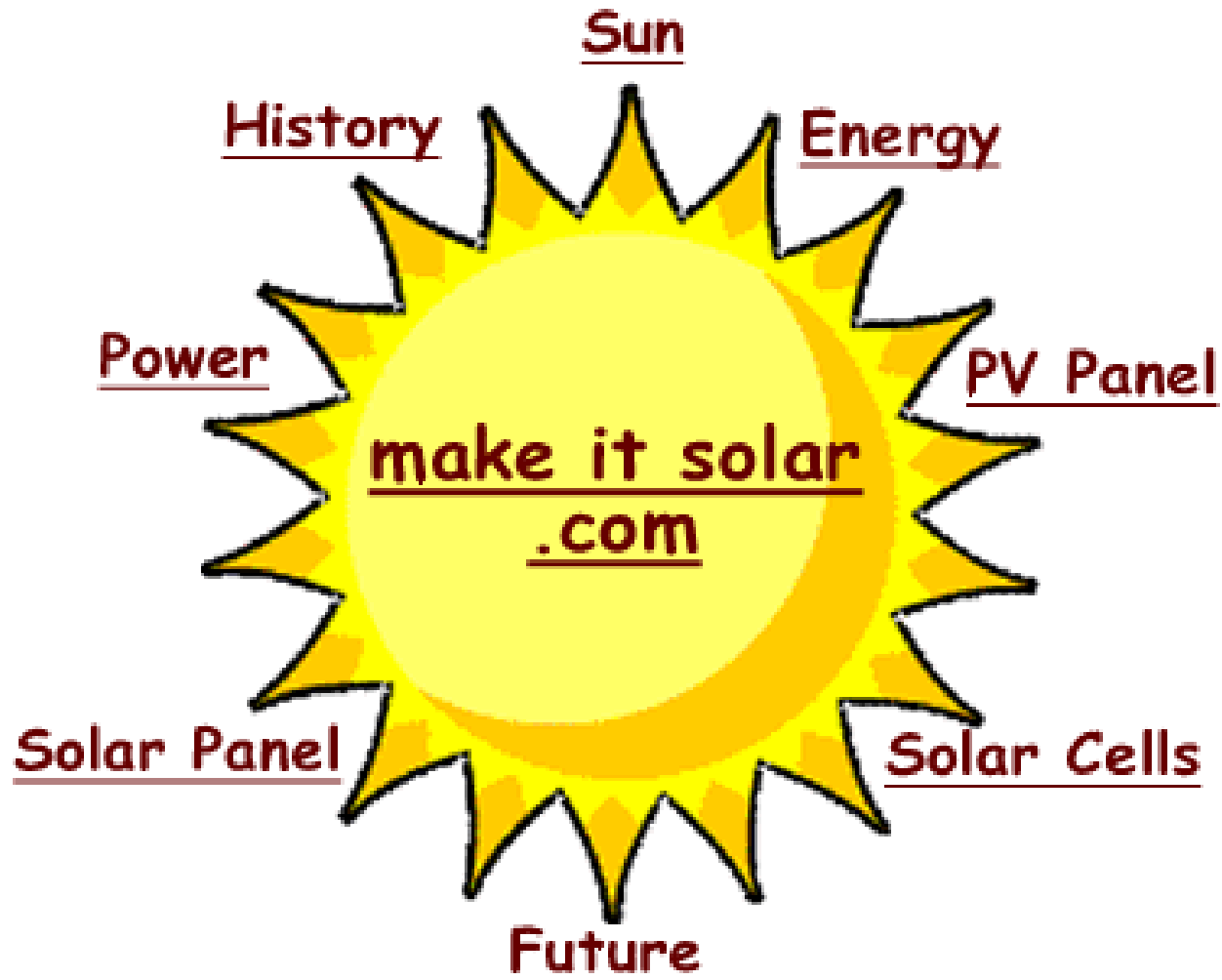
Disadvantages -Hydroelectric Energy



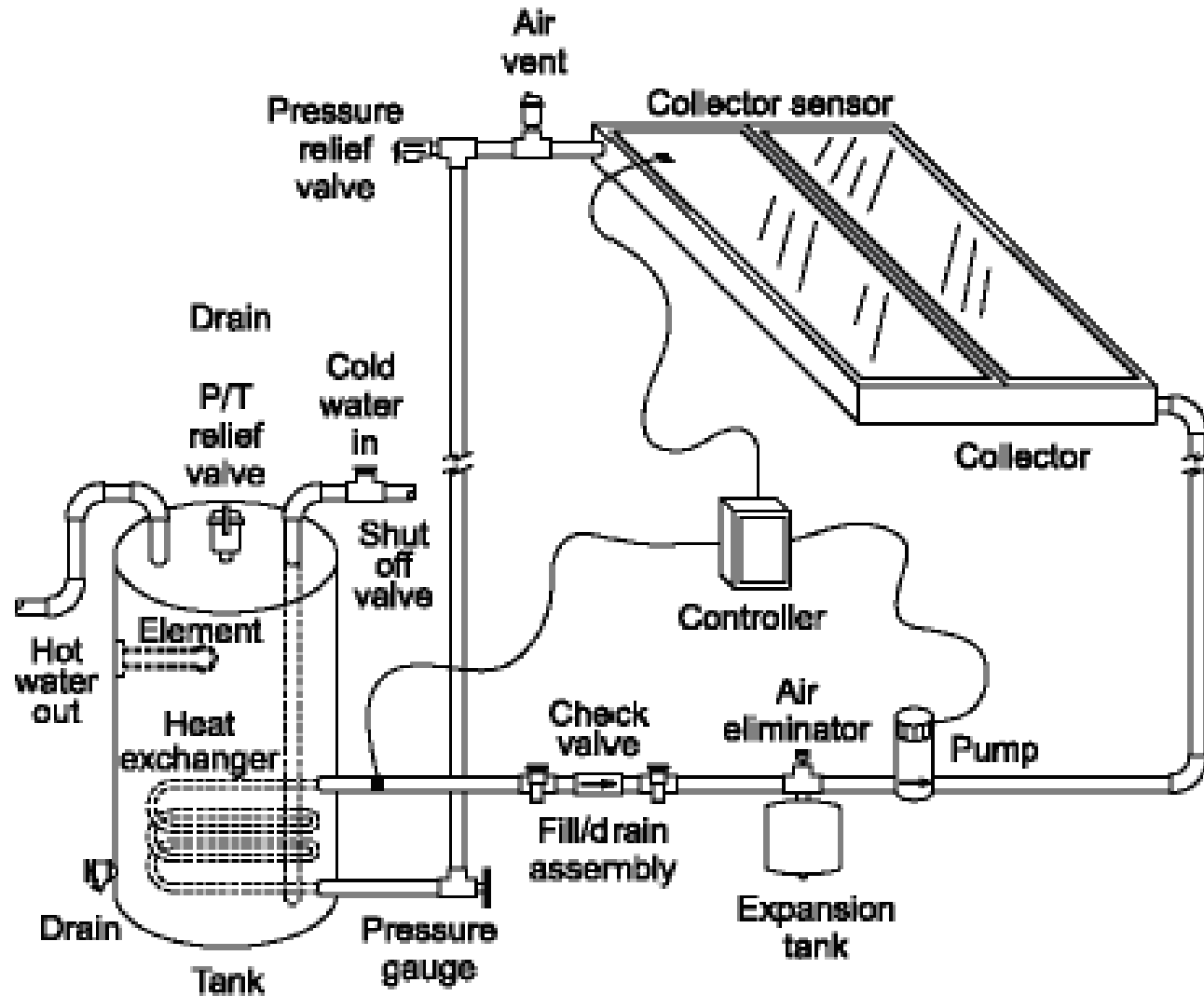
- **Smaller models depend on availability of fast flowing streams or rivers.**
- **Run-of-the-River plants can impact the mobility of fish and other river-life.**
- **NOTE: Building a fish ladder can lessen this negative aspect of hydroelectric power.**



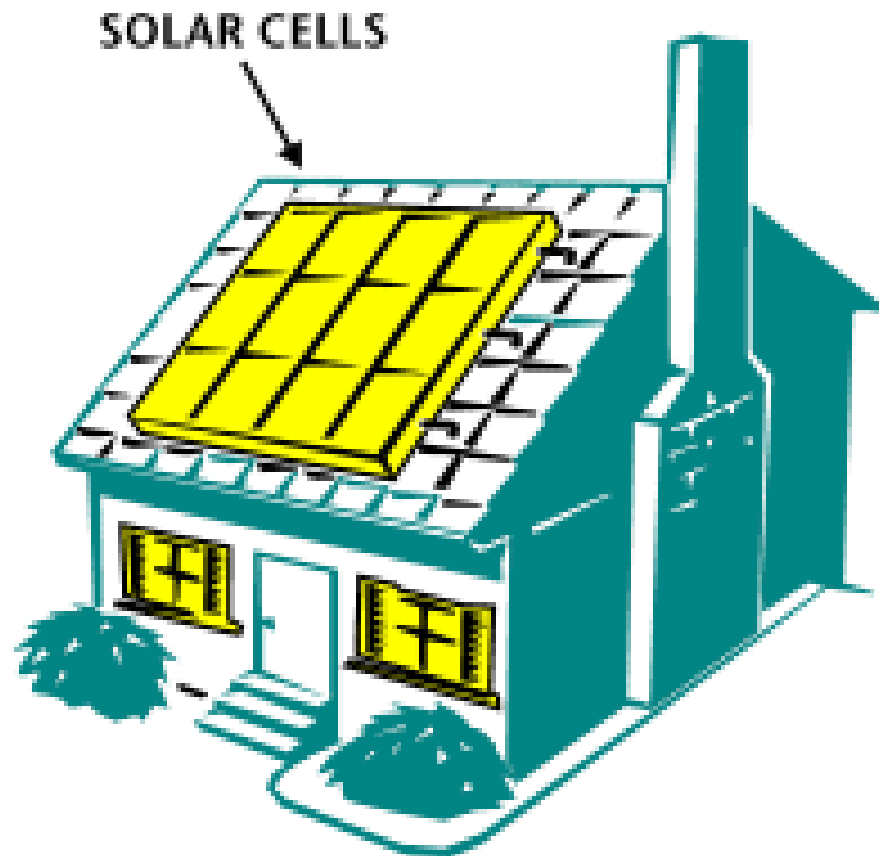
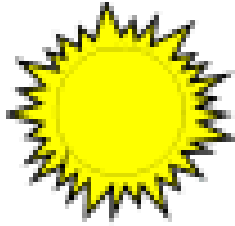
Solar Energy



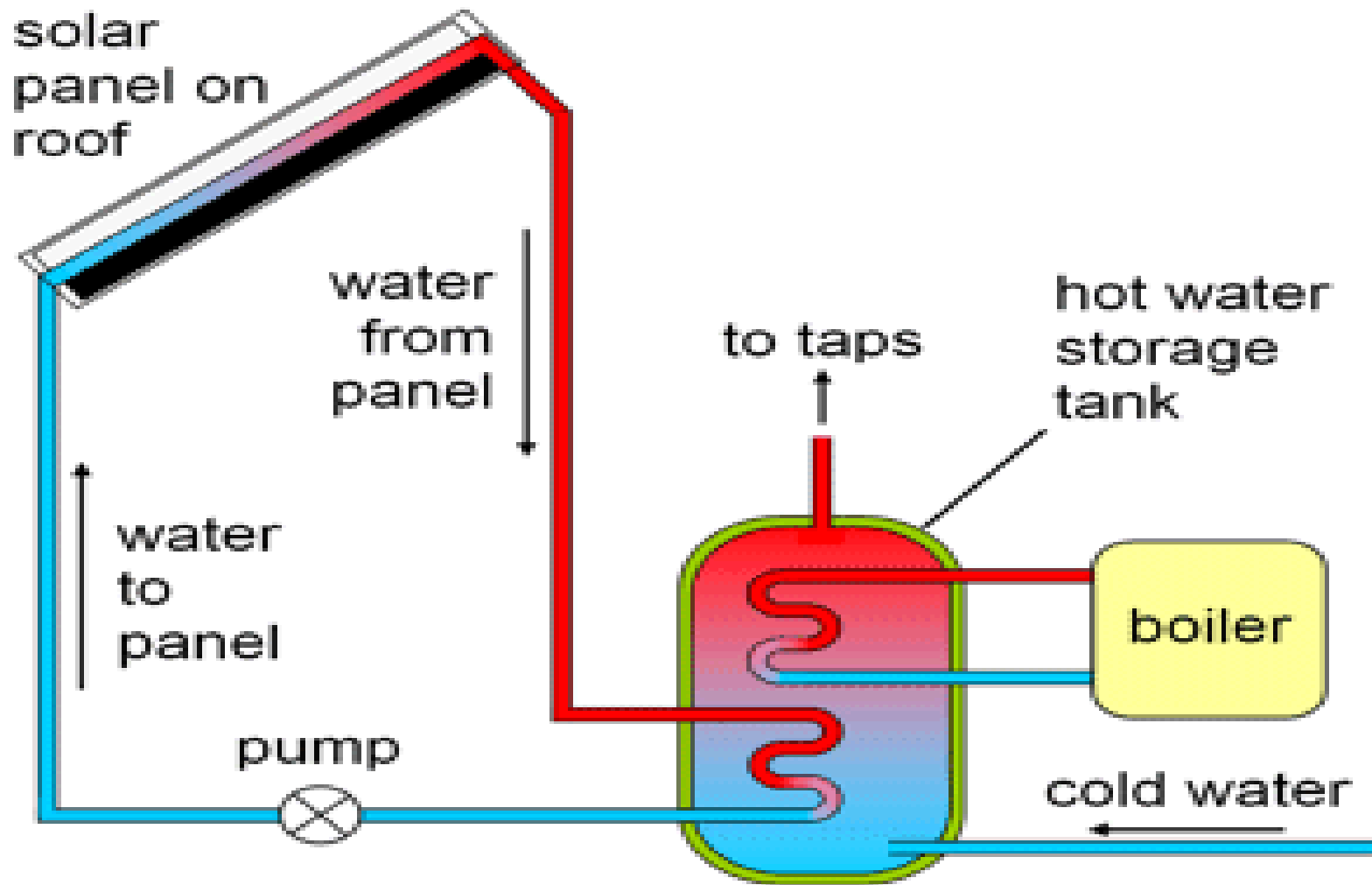
Theory -Solar Energy



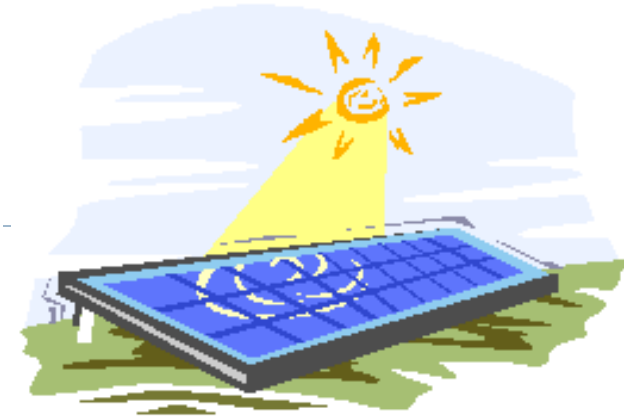
Theory -Solar Energy



Theory -Solar Energy



Advantages -Solar Energy



- **Inexhaustible fuel source.**
- **No pollution.**
- **Often an excellent supplement to other renewable sources.**
- **Is used for powering items as diverse as solar cars and satellites.**



Disadvantages -Solar Energy



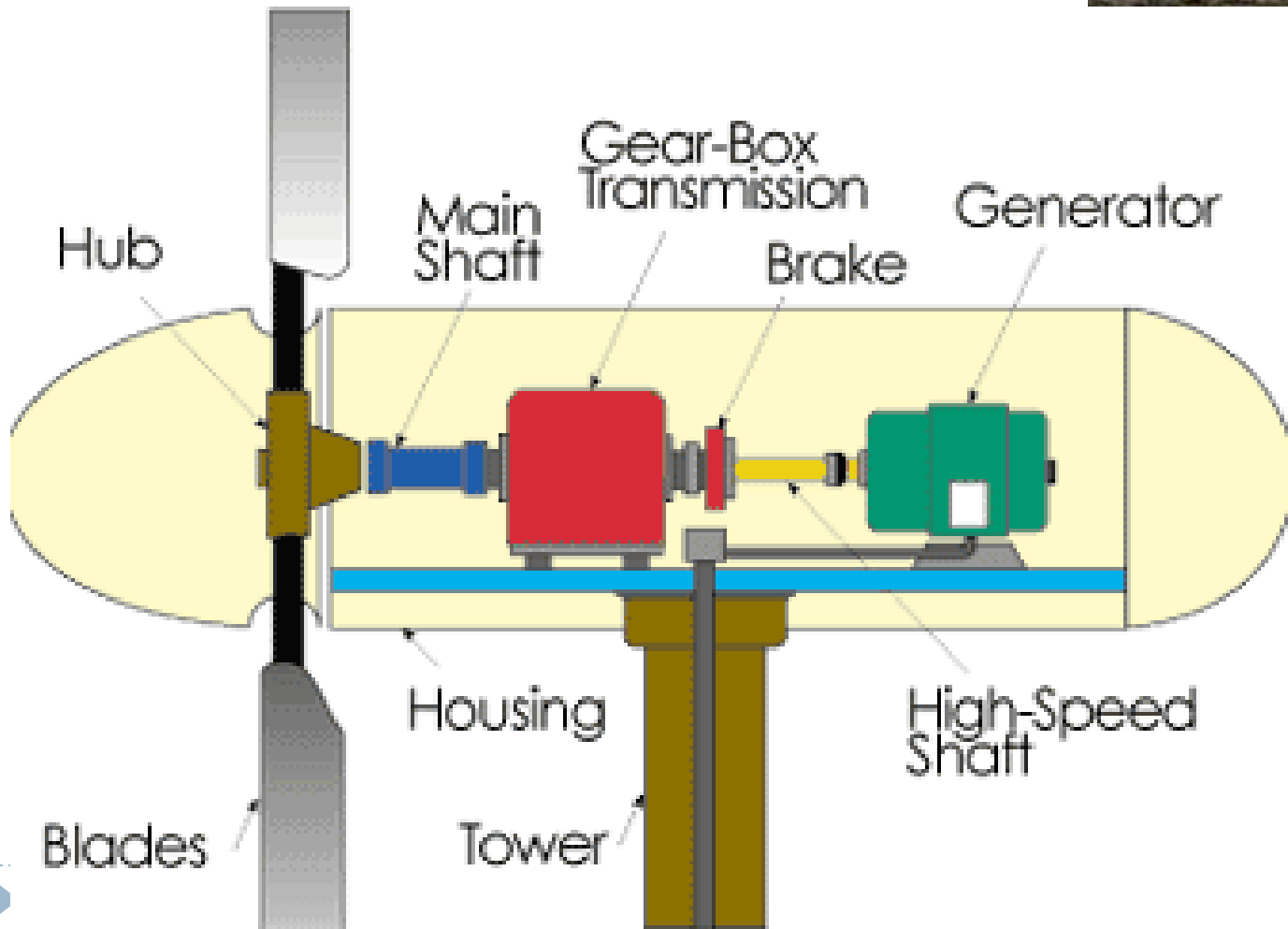
- ▶ **Very diffuse source means low energy production--large numbers of solar panels (and thus large land areas) are required to produce useful amounts of heat or electricity.**
- ▶ **Only areas of the world with lots of sunlight are suitable for solar power generation.**



Wind Energy



Theory -Wind Energy



Advantages -Wind Energy

- ▶ **Inexhaustible fuel source.**
- ▶ **No pollution.**
- ▶ **Often an excellent supplement to other renewable sources.**

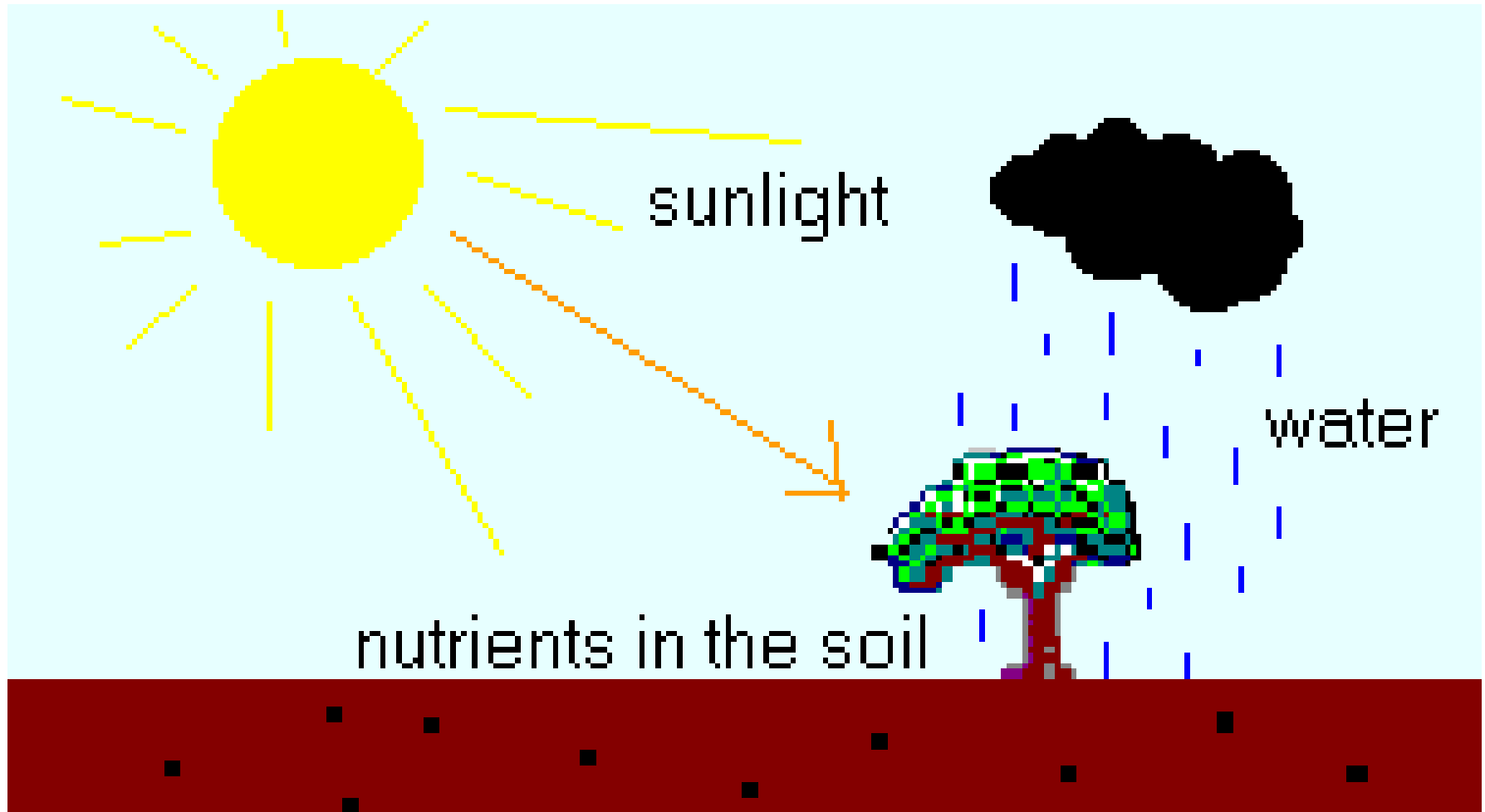


Disadvantages -Wind Energy

- ▶ **Very diffuse source means low energy production--large numbers of wind generators (and thus large land areas) are required to produce useful amounts of heat or electricity.**
 - ▶ **Only areas of the world with lots of wind are suitable for wind power generation.**
 - ▶ **Relatively expensive to maintain.**
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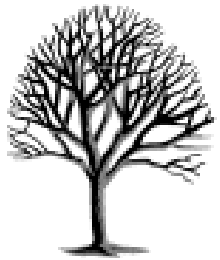


Biomass Energy

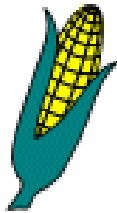


Theory -Biomass Energy

Types of Biomass



Wood



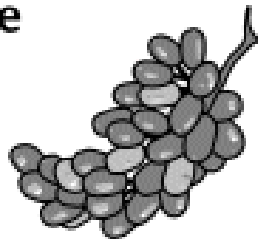
Crops



Garbage



Landfill Gas



Alcohol Fuels



Advantages -Biomass Energy

- **Theoretically inexhaustible fuel source.**
- **Minimal environmental impact.**
- **Alcohols and other fuels produced by biomass are efficient, viable, and relatively clean-burning.**
- **Available throughout the world.**



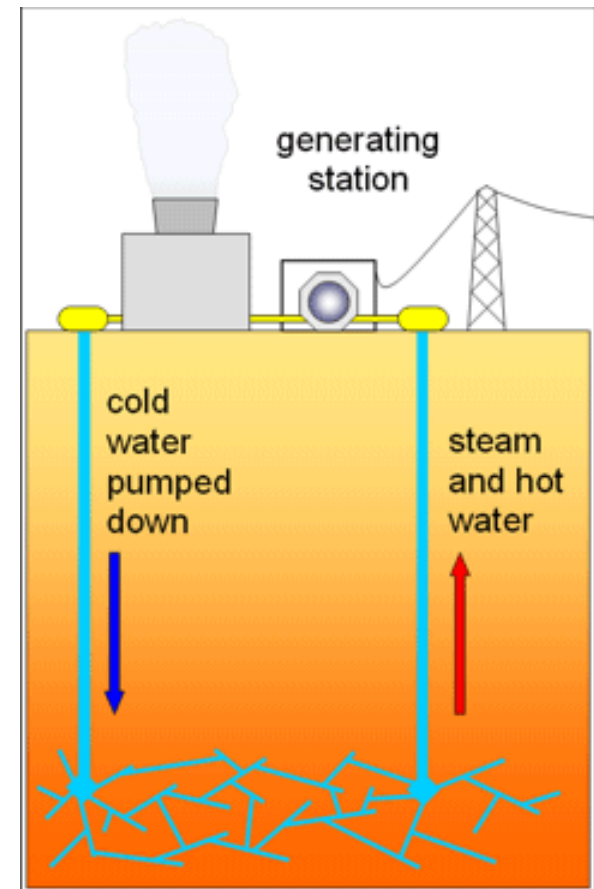
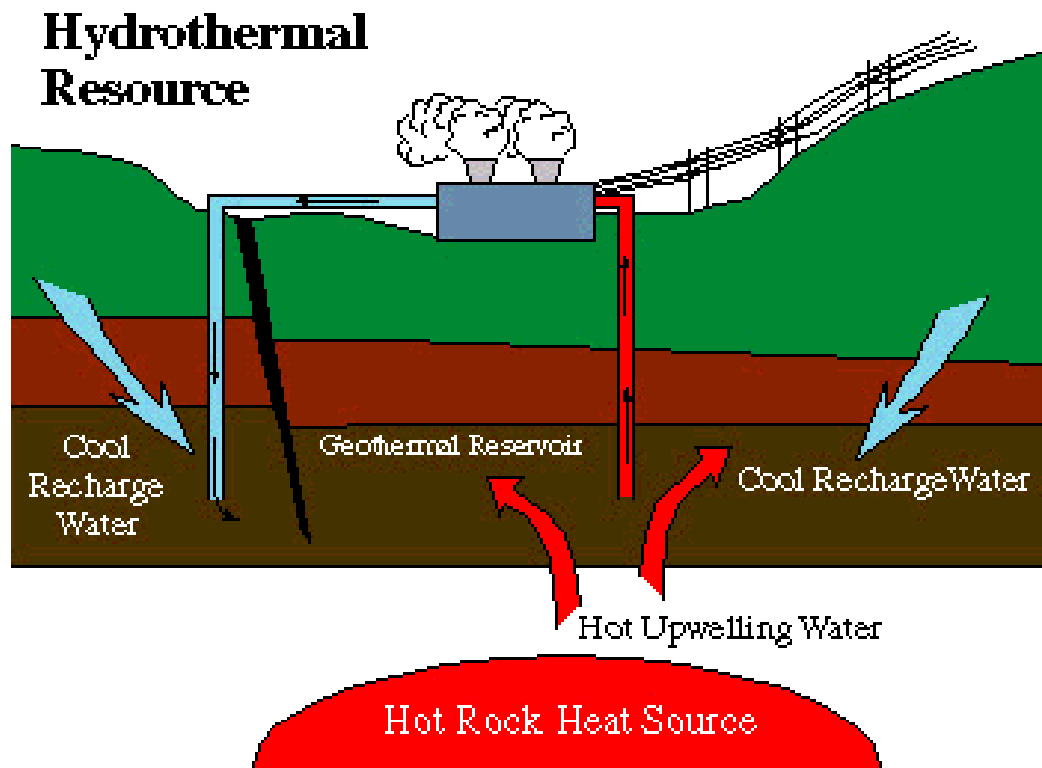
Disadvantages -Biomass Energy

- **Could contribute a great deal to global warming and particulate pollution if directly burned.**
- **Still an expensive source, both in terms of producing the biomass and converting it to alcohols.**
- **On a small scale there is most likely a net loss of energy.**



Geothermal Energy

The center of the earth can reach 6000 °C



Advantages -Geothermal Energy

- ▶ **Theoretically inexhaustible energy source**
- ▶ **No pollution**
- ▶ **Often an excellent supplement to other renewable sources**
- ▶ **Does not require structures such as solar panels or windmills.**
- ▶ **Can be directly used to heat or produce electricity (thus very cheap)**



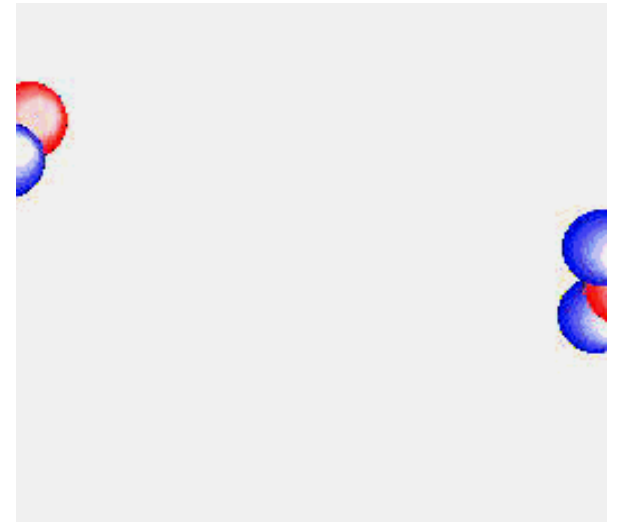
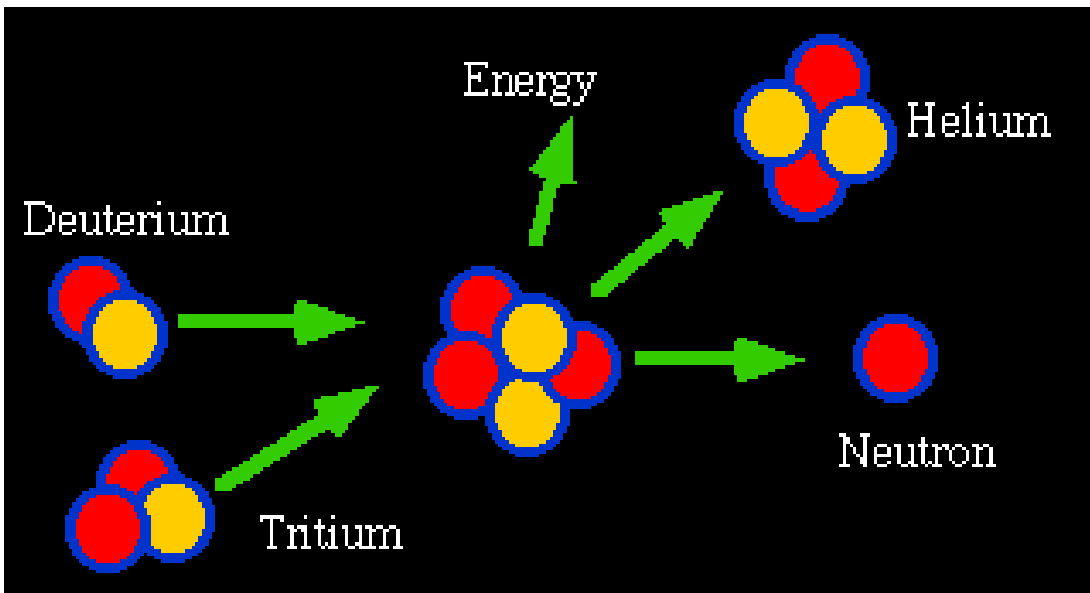
Disadvantages -Geothermal Energy

- ▶ **Not available in many locations**
- ▶ **Not much power per vent**



Fusion Energy

- **Squashing two nuclei into one**



Theory -Fusion Energy

- ▶ **Tritium and Deuterium**
- ▶ **Relatively powerful energy source**
- ▶ **There is 1 deuterium atom in every 6500 hydrogen atoms in ordinary seawater**
- ▶ **Tritium can be bred from lithium, an element common in the earth's crust.**



Advantages -Fusion Energy

- ▶ **The fuel for fusion reactions are readily available.**
- ▶ **Deuterium and Tritium are virtually inexhaustible.**
- ▶ **Does not emit harmful toxins into the atmosphere.**
- ▶ **Fusion has no nuclear waste.**



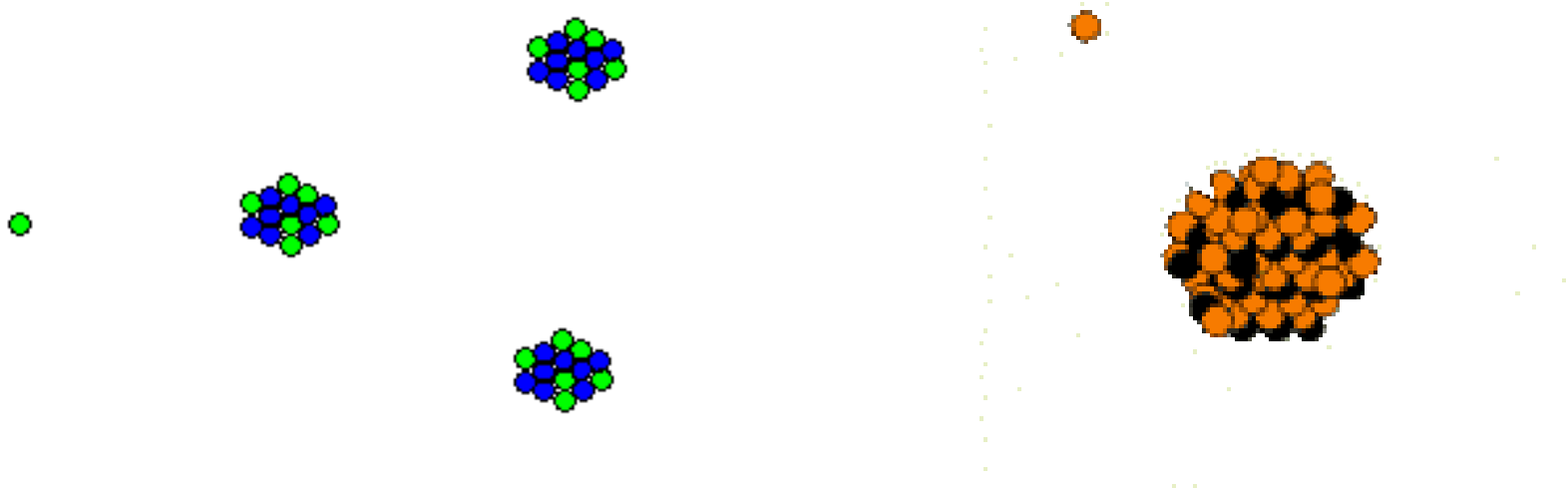
Disadvantages -Fusion Energy

- ▶ **Scientists have not yet been able to contain a fusion reaction long enough to be a net energy gain.**
- ▶ **Many countries are phasing out fusion research because of the failure to reach a breakthrough**



Fission Energy

- ▶ **Nuclear fission involves the splitting of a heavy element into lighter elements.**



Advantages -Fission Energy

- ▶ **Relatively little fuel is needed.**
- ▶ **The fuel is relatively inexpensive and available in trace amounts around the world.**
- ▶ **Fission is not believed to contribute to global warming or other pollution effects.**



Disadvantages

-Fission Energy

- ▶ **Possibility of nuclear meltdown from uncontrolled reaction--leads to nuclear fallout with potentially harmful effects on civilians.**
- ▶ **Waste products can be used to manufacture weapons**
- ▶ **High initial cost because plant requires containment safeguards**



Other Energies

- ▶ **Potential Energy**
- ▶ **Kinetic Energy**
- ▶ **Heat Energy**
- ▶ **-----**



Thank You

► Any questions ?

